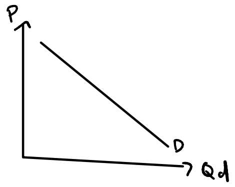


Law of Demand

P↑, Qd↓

P↓, Qd↑

Consumers: want more satisfaction

unit for utility: utils.

Cohort: 2207 EC.DMA Revised on: 27 January 2023

A2 Part 7.1: Utility

(Smith, 2^{nd} ed., Chapter 14, pp. 197–201)

7.1.1	definition and calculation of total utility (TU) and marginal utility (MU)
7.1.2	diminishing marginal utility
7.1.3	equi-marginal principle
7.1.4	derivation of an individual demand curve
7.1.5	limitations of marginal utility theory and its assumptions of rational behavior

Definition and calculation of TU and MU

The concept of utility:

- **Utility** is the happiness and satisfaction received from consuming a good or service.
- **Marginal utility** is the additional utility consumer receives from an additional unit (or one more unit) of a good or service.
- **Total utility**: the total satisfaction received from the consumption of all chosen units of a good or service.

Diminishing marginal utility

- Marginal utility **diminishes** the more of a good is consumed.

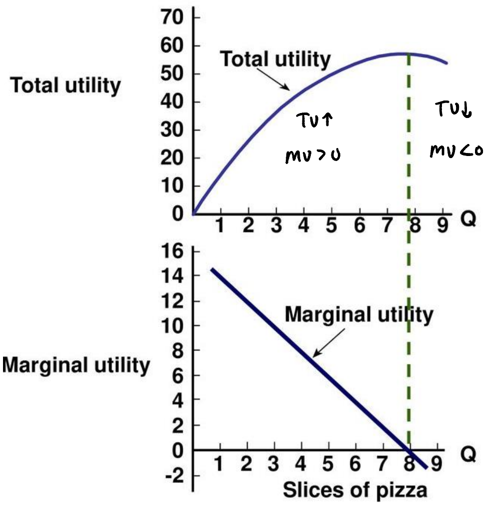
Law of diminishing marginal utility (LDMU) refers to the situation where the consumption of successive units of a product will eventually lead to a fall in marginal utility, i.e. as someone consumes more units a product, the satisfaction provided by each successive unit will be progressively less.

LDMU states that the **MORE** units of a good that are consumed, the **LOWER** the utility from consuming those additional units.

There is an important relationship between the Law of diminishing marginal utility and the derivation of the **individual demand schedule**. If the marginal utility of consuming extra units of product continually diminishes, a consumer will be unwilling to pay as much for each successive unit consumed, i.e. as the utility falls, so will the price that a consumer is willing to pay. This can be shown in an individual demand schedule and explains why a demand curve for a product is **downward sloping** from left to right; as quantity increases, price falls.

It is assumed that the marginal utility (MU) of a product can be measured by the price an individual is prepared to pay for it. This is why **an individual's demand curve** for a product will be the same as their **marginal utility curve** and an individual will purchase a product up to the point where **P=MU**. Hence, the **MU curve is the demand curve for an individual.**

Number of pizza slices	Total Utility (TU)	Marginal Utility (MU)
0	0	-
1	14	
2	26	
3	36	
4	44	
5	50	
6	54	
7	56	
8	56	
9	54	



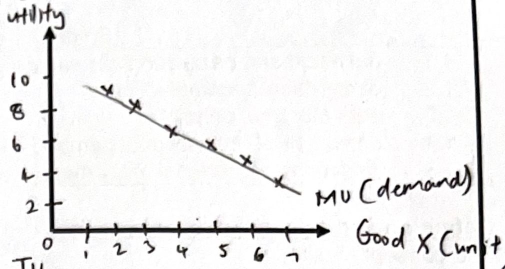
Total utility increases up to a certain quantity of units of a product consumed, but at **a decreasing rate**. This is because the **marginal utility** of consuming additional units of a product is **decreasing**.

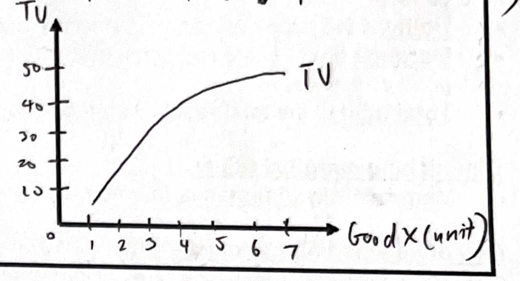
At the point where total utility is at the **maximum**, marginal utility is equal to **ZERO**. When total utility begins to decline, marginal utility become **negative**.

TU↑	TU_{max}	TU↓
MU↓ MU>0	MU=0	MU↓ MU<0

Exercise 14.1 (p.198)
Table 14.2 shows the total utility that Nazim obtains from consuming a good.

Unit of X	Total utility (utils)	Marginal utility (utils)
1	10	–
2	19	9
3	27	8
4	34	7
5	40	6
6	45	5
7	49	4





a. Calculate the marginal utility at each level.

b. Draw the MU curve on a diagram.

Maximising satisfaction

Assumptions: Consumer has limited income; consumer is rational; and consumer maximises total utility.

The equi-marginal principle: the principle that a rational individual, wishing to maximise total utility, will allocate their expenditure amongst different products so as to ensure that the satisfaction or utility gained from the last unit of money spent on each product is the same.

It can be represented as follows:

$$\frac{\textbf{Marginal utility of A}}{\textbf{Price of A}} = \frac{\textbf{Marginal utiltiy of B}}{\textbf{Price of B}} = \frac{\textbf{Marginal utiltiy of C}}{\textbf{Price of C}}$$

To maximise their utility or satisfaction, a consumer will be at the situation shown above for the three products, good A, good B and good C. The extra satisfaction produced by the last unit of good A consumed, in relation to the money spent to buy this last unit, will be equal to the extra satisfaction produced by the last unit of good B consumed, in relation to the money spent to buy the last unit and this will be equal to the extra satisfaction produced by the last unit of good C consumed, in relation to the money spent to buy this last unit.

To maximise **satisfaction:** Equalizing marginal utility per dollar: spent all the available income and equalize the MU per dollar for all goods.

If the price of a product **falls,** the extra satisfaction gained from the last unit of money spend on the product will give **greater satisfaction** than that spent on another product that hasn't fallen in price.

If the price of a product **falls**, and the prices of other products remain unchanged, the **quantity** of that product will **increase** until the equality shown by the equi-marginal principle is restored.

$$\boxed{MU_X = P_X}$$

One good:

If P_X rises, $MU_X < P_X$. Rational consumer will ↑ MU_X. Therefore, consumer will consume **LESS** of good X, **so quantity demanded of X ↓.** Price of good X ↑, quantity demanded of good X ↓ (Law of demand)	① initial $MU_x = P_x$ ② $P_x\uparrow$, $MU_x < P_x$ ③ To restore back to ① ④ increase MU_x , buy less of Good x
If P_X falls, $MU_X > P_X$. Rational consumer will ↓ MU_X. Therefore, consumer will consume **MORE** of good X, **so quantity demanded of X ↑.** Price of good X ↓, quantity demanded of good X ↑	① initial $MU_x = P_x$ ② $P_x\downarrow$, $MU_x > P_x$ ③ To restor back to $MU_x = P_x$ ④ $\downarrow MU_x$, buy more of good X.

More than 2 goods (Law of equi-marginal utility) $\boxed{\frac{MU\,x}{P\,x} = \frac{MU\,y}{P\,y}}$

If P_X ↑, P_Y unchanged, (MU_X/P_X) ↓. Thus $(MU_X/P_X) < (MU_Y/P_Y)$. To restore the equality shown by the equi-marginal principle: $(MU_X/P_X) = (MU_Y/P_Y)$, consumer must increase (MU_X/P_X) by ↑ MU_X. To increase MU_X, consumer will buy LESS of good X, so quantity demanded of X ↓. Price of good X ↑, quantity demanded of good X ↓ Law of Demand.	① $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$ ② $P_x \uparrow$, $\bar{P_y}$: $\frac{MU_x}{P_x} < \frac{MU_y}{P_y}$ ③ To reston to ① ④ $MU_x \uparrow$ → consumer buy less
If P_Y ↑, P_X unchanged. (MU_Y/P_Y) ↓. Thus $(MU_X/P_X) > (MU_Y/P_Y)$. To restore the equality shown by the equi-marginal principle: $(MU_X/P_X) = (MU_Y/P_Y)$, consumer must increase (MU_Y/P_Y) by ↑ MU_Y. To increase MU_Y, consumer will buy **LESS** of good Y, so quantity demanded of Y ↓. Price of good Y ↑, quantity demanded of good Y ↓ Law of demand	① $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$ ② $P_y \uparrow$, $\bar{P_x}$: $\frac{MU_x}{P_x} > \frac{MU_y}{P_y}$ ③ restore to ① ④ $MU_y \uparrow$ → consumer buy less.

The price of good A is £1 and the price of good B is £2. The income of consumer is £14.

Q_A	TU_A	MU_A	£1 MU_A / P_A	Q_B	TU_B	MU_B	£2 MU_B / P_B
0	0	-	-	0	0	-	-
1	10	10	10	1	16	16	8
2	19	9	9	2	30	14	7
3	27	8	8	3	42	12	6
4	34	7	7	4	52	10	5
5	40	6	6	5	60	8	4
6	45	5	5	6	66	6	3
7	49	4	4	7	70	4	2

Question:
Calculate the marginal utility per pound of good A and good B. How many units of good A and good B will the consumer buy to maximise his/her utility?

Step #1: Calculate MU_A and MU_B

Step #2: Calculate MU_A / P_A and MU_B / P_B

Step #3: Compare the values between MU_A / P_A and MU_B / P_B and list down the combinations that have the same value.

MU_A / P_A = MU_B / P_B	Combination: Q_A + Q_B	Amount Needed	Affordable / Not affordable / Can save
8	3A + 1B	£3 + £2 = £5	Affordable, and can save £9
7	4A + 2B	£4 + £4 = £8	Affordable, can save £6
6	5A + 3B	£5 + £6 = £11	Affordable, can save £3
5	6A + 4B	£6 + £8 = £14	Affortable, spent all income
4	7A + 5B	£7 + £10 = £17	Not affordable, short of £3.

Step #4: To maximise utility, MUST spent ALL income with MU_A / P_A = MU_B / P_B.
Answer: To maximise utility, the consumer will buy 6 good A and 4 good B.

Limitations of marginal utility theory and its assumptions of rational behavior
The law of diminishing marginal utility is based on a number of assumptions, but if these assumptions do not actually apply, there will be limitations to the theory.

These **assumptions** include the following:

- The idea that the utility or satisfaction that an individual gains from the consumption of a product can be **easily measured**, but this may not necessarily be so.
- The idea that consumers behave in a **rational way**, but this may not always be the case.
- The idea that consumers have **limited incomes**, but it is possible that incomes may rise over a period of time.
- The idea that consumers can be expected to **maximise their total utility**, but his may not always be so.
- The idea that **prices are constant**, but the prices of products are likely to be continually changing.
- The idea that **consumer's taste and preferences remain constant**, but these may change over time, perhaps as a result of advertising campaigns.
- The idea that the consideration of **marginal utility is vitally important**, but this may not always be the case, especially where consumption is habit forming or made on impulse.
- The idea that **all units of a product available for consumption are identical**, but if quality control in the production process is not very efficient, this may not always be so.

Do consumers always act rationally? (p. 200)
Behavioural economics: a branch of economics that builds on the psychology of human behaviour in decision making.

Rational behaviour versus behavioural economic model
The rational behaviour of consumers is based on the idea that they will maximise their utility, given the following constraints: limited income, a given set of prices and constant tastes and preferences.

Rational behaviour essentially means the following:

- individual consumers will take decisions to **maximise their utility and satisfaction**
- individual consumers will have **access to all the information** that they require to make a decision at zero cost
- individuals take decisions that are based on **a very careful comparison of benefits and costs** to achieve the optimal outcome
- these decisions will be taken by individuals based on **changes at the margin**, stressing the importance of the margin as a key economic concept
- the tastes and preferences of individuals and their attitude to risk are assumed to be **fixed**

However, **behavioural economic models** have been developed to offer a contrast to the idea of rational behaviour. Behavioural economics attempts to explain the decision taken by individuals in practice, particularly when they are opposed to those predicted by traditional economic theory, i.e. it attempts to explain what might appear apparently 'irrational' behaviour.

The key elements of **behavioural economic models** include the following:

- instead of attempting to achieve optimal outcomes as a result of taking decisions, individuals take decisions based on the potential gains and losses that might arise.
- individuals may **not always possess all the relevant information** that they require, possibly because of reasons of time and/or cost, giving, rise to the existence of an opportunity cost in terms of possible alternative uses of this time and/or money
- there may be just **too much information available**, making decision taking more difficult; and individual's ability to act rationally is therefore restricted or 'bounded', and so they may engage in satisficing rather than optimizing behaviour (this is known as **bounded rationality**).
- individuals may take decisions based on rules of thumb (known as **heuristics**), simplifying what is involved in the decision-making process, or on the first piece of information received (known as **anchoring**).
- decisions can be based on assumptions, even though this could lead to irrational decisions.
- the way that information is presented can influence behaviour (this is known as **framing**).
- individuals can be **'nudged'** to take particular decisions, such as **through government advertising**.

Remember:
Although the idea of rational behaviour has played a key role in traditional economic theory, it is now being increasingly challenged by behavioural economic models.